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Indian Standard

AUTOMOTIVE TYRES — SELECTION AND INSPECTION OF RETREADABLE TYRE CASING

ICS 83.160.10

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 2

Automotive Tyres, Tubes and Rims Sectional Committee, TED 7

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE TYRES — SELECTION AND INSPECTION OF RETREADABLE TYRE CASING

1 SCOPE

This standard prescribes the selection criteria and inspection methods of retreadable tyre casing, so that each casing that passes the selection and inspection process shall be acceptable for the process of retreading.

2 REFERENCE

The following standard contains provisions, which through reference in this text, constitute provisions of this standard. At the time of publication the edition indicated was valid. All standards are subject to revision and parties to agreements based on this standard is encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
3400 (Part 1) : 1987	Methods of test for vulcanized rubbers: Part 1 Tensile stress/strain properties (*second revision*)

3 TERMS AND DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Casing — Casing is a worn tyre comprising carcass and remaining retread and sidewall material.

3.2 Retreadable Casing — The casing suitable for retreading after inspection.

3.3 Casing Distortion — A processing defect in which the natural shape of the tyre is deformed by constriction in the matrix during the retreading process.

3.4 Corrosion — Degradation of steel reinforcement in the tyre.

3.5 Chunking — Breaking away of pieces of rubber from the tread.

3.6 Circumferential Breaks — A tyre injury running parallel to the bead.

3.7 Circumferential Crack — Cracks in a tyre running parallel to the beads. Usually consists of cracks in the tread grooves.

3.8 Cracking — Splitting in the tread grooves.

3.9 Cracks — A parting with in the rubber tread that does not extend to or through the cord material.

3.10 Creep — Slow change in the strain.

3.11 Delamination — A smooth separation between layers of material.

3.12 Deflation — The distortion of tyre from its normal shape.

3.13 Carcass — Structure or skeleton of tyre.

3.14 Green Tyre — A built tyre (new or retreadable) before being cured.

3.15 Groove Cracking — Cracking which occurs at the bottom of tread groove.

3.16 Injury (Injuries) — Any damage caused by the penetrating object or severe scuff or impact.

3.17 Injury Size — The widest opening in the cord body after skiving and buffing.

3.18 Nail Hole — A small puncture through a tyre made by a sharp object such as a nail or screw.

3.19 Open Splice — A defect caused by failure of the rubber to knit together properly at the splice during cure.

3.20 Overloading — Tyre overloading can be dangerous and is not recommended. However, note that tyre load capacity can be increased in certain cases by increased inflation or control to lower speeds.

3.21 Ozone — A form of oxygen that accelerates aging and weathering in tyres.

3.22 Ozone Checking — The formation of fine cracks in a rubber surface due to ozone in the environment.

3.23 Penetration — Damage to a tyre caused by a piercing object not completely going through a casing.

3.24 Ply — Layer of rubber coated parallel cords.

3.25 Ply Separation — Parting of rubber compound between adjacent plies.

3.26 Porosity — Tiny air pockets in the rubber caused by poor mould fit, insufficient rubber, or lack of pressure.

3.27 Puncture Repair — An off-the-wheel repair of any injury caused by a penetrating object. The type of repair is determined by the size and depth of the injury.

3.28 Radial Cracking — Cracking, usually in or near the sidewall area, resulting from the under inflation (Cracks are perpendicular to the bead).

3.29 Ream — Clean any injury or hole prior to repairing.

3.30 Retread Separation — Tread detachment from the tyre at the interface of the new tread and buffed surface.

3.31 Retreadability — Ability of the tyre casing to be retreaded and provide acceptable performance.

3.32 Retreaded Tyre — A casing to with a new tread has been affixed to extend the usable life of the tyre.

3.33 Run Flat — Tyre damage resulting from operation with low or no air pressure, some times identified by repetitive liner cracking or discolouration.

3.34 Rust — Advanced stage of corrosion.

3.35 Section Repair — Repairs made to a casing when any injury extends through the tread or sidewalls of the tyre. The damaged cord is removed and replaced by a repair unit.

3.36 Separation — Pulling apart of plies (from each other), such as ply separation or tread separation (from plies).

3.37 Shaping — Buffing a casing to a shape that properly fits the contour of a matrix cavity.

3.38 Sidewall Separation — Separation of the rubber compounds and plies in the sidewall.

3.39 Sizing — Measurement of casing to determine the proper mould fit. Usually a combination of bead-to-bead, cross-section and diameter of a circumference. Also referred to as mould fitment.

3.40 Spot Repair — Replacement of rubber in an injury that penetrates less than 25 percent of the body plies.

3.41 Turn Tread — Small pieces of tread torn off during extraction from mould in new or retreaded tyres.

3.42 Tread Separation — Pulling away of tread from the tyre casing.

3.43 Tread Tearing — Tearing away of a portion of the tread design.

3.44 Turn-Up — Part of the body ply that wraps under the bead bundle and ends in the tyre sidewall.

3.45 Weather Checking — Fine cracks in the tyre sidewall surface caused by oxidation and other atmosphere effects.

4 TEST METHODS

4.1 Tyres are to be inspected on a mechanical spreader. These spreaders allow the inspector to visually examine each tyre internally and externally for defects and damage.

4.1.1 In addition to properly functioning tyre spreaders, adequate lighting is necessary. The tyre inspection area, in general, shall be well lighted. The place where tyres are being inspected should have internal lighting of not less than 200 foot-candles. The recommended lighting is 300 foot-candles. A simple light meter can measure the effectiveness of the actual lighting.

4.1.2 An industrial-tyre vacuum system is recommended to remove debris and water from inside a tyre.

4.2 Non-destructive Testers

The following popular devices may be used for non-destructive tyre inspections.

4.3 Oliver Tuff Scan II

This unit has a ultra high frequency systems to detect internally defects. This unit has the capability of sidewall-to-mid-sidewall range of inspection. A tyre defect will automatically trigger a device that marks the defected area with small spots of paints. This unit may be used without buffing the tyre.

4.4 Hawkinson NDT II

These are three Hawkinson NDT units — trucks, passenger/truck combination, and a casing analyzer to detect nail hole penetration from mid-sidewall-to-mid-sidewall during inspection. These units operate on a high frequency electric system that emits a visible spark when nail hole or penetration is detected. These testers can stand alone or be mounted on a spreader. This unit can also be used without buffing the tyre.

4.5 Matteuzzi Testing Machine

This unit is designed for testing casings. The tester uses pressure to cause sidewall to show weaknesses and defects during inflation. The tyre inflated in three stages with pressure ranging from 1.4 to 8.3 bars, while the operator looks for any unusual humps, bulges, or irregularities in the sidewall.

4.6 Casing Storage

Tyres and moisture (water) are enemies, particularly if the moisture is inside the tyre or in injury moisture penetrates through casing, the inner-liner can cause havoc with the structure of a tyre body. If the tyre is a steel radial truck tyre, moisture penetration can cause the steel cables to rust and corrode. This could weaken the strength of the steel cables and lead to premature failure. In the tyre fabric, moisture may cause weakness or separation between the plies. All tyres to be retreaded shall be moisture-free and stored in dry areas. These areas should protect the tyres from rain, fog, snow, ice, etc. Tyres should not be laced or thrown together in a haphazard fashion. This tends to distort steel belts and results in products that thump, bump, or have crooked treads. The best way to store tyres is to stack them flat in piles no higher than eight passenger and light truck, or medium truck tyres.

5 INSPECTION

5.1 Tyres should be inspected in dry and clean condition. A wet vacuum is to be used to remove water and then wipe the tyre dry. This should be done the day before the inspection to allow the casing to dry thoroughly. Tyre punctures, inner liner splits and other damages may go undetected in wet or dirty tyres.

5.2 Causes for Rejection

a) Broken or loose cords beyond repair limits;

b) Excessive cracking;

c) Ply separation;

d) Excessive tool damage;

e) Non-repairable (open) liner splices;

f) Run flat;

g) Tubeless tyres with visible bond ply through the liner stock and splice opening;

h) Bad cable;

j) Excessive or large liner blisters; and

k) Previous repairs showing signs of failure or unreliability.

5.3 Bead Conditions

a) Bent, distorted, or broken beads;

b) Excessive cracking or chafing area. In bias tyres, minor chafer fabric damage can be spot repaired;

c) Tyres having ply or chafer separation;

d) Cuts penetrating the wire that have caused rust and/or separation;

e) Deep cuts in the tyre body ply in the non-repairable bead area;

f) Excessively loose liner at the bead toe;

g) Note any deformations of the bead due to improper mounting or excessive wear; and

h) When inspecting the tread area, mark with a crayon to indicate the starting point.

5.4 Tread Conditions

a) Damage requiring repairs to be placed too close together;

b) Tyres with tread breaker, belt, or ply separation;

c) Excessive wear, making buffing impossible for mould or precure retreading;

d) Excessive rust in radial tyre belt package;

e) Deep regrooving that excessively damages the belt;

f) Cutting, tearing and chunking which cause excessive exposed belts;

g) Tread injuries that fall outside the acceptable repair limits;

h) Use an awl to probe all cuts and penetrations. Mark all punctures. Mark all deep cuts for repair or reject, if too deep or non-repairable. Watch for rust spots in the tread cuts of steel radial tyres; and

j) Note sidewall damage — lacerations, cuts, etc. Watch for broken sidewall body cables in radial truck tyres. Mark all repairable damage.

5.5 Sidewall Conditions

a) Side wall injuries that fall outside the acceptable repair limits;

b) Separation or deep cracking in sidewall at the ply turn up. A very thorough inspection of the area ranging up to 25.4 mm outside the G-G (rim aligning) ring on the lower sidewall must be made. Expanding beads laterally with certain spreaders can show this separation;

c) Wild wire through the tyre sidewall;

d) Sidewall separations or broken wires appearing as bulges;

e) Tyres having sidewall separations, bruise breaks, and bow outs;

f) Circumferential or radial cracking due to flexing or deep branding;

g) Non-repairable flow cracks;

h) Tyres with weather cracking in sidewall/shoulder areas as follows:

  1) Deeper than 2.4 mm not acceptable;
  2) 1.6 mm to 2.4 mm for trailer application only;
  3) Up to 1.6 mm for trailer application.

j) Be sure that the condition is weather cracking and not flex cracks. Weather cracking should not form a connected line;

k) Tyres contaminated with oil and grease;

m) All radial tyres that have been punctured or previously repaired should be carefully inspected in the sidewall area for broken or weaken cable damage. If the tyre is accepted for retreading but needs repairs, mark any and all repairs on the tyre and the tyre cord; and

n) Be careful when stapling tyre tags on steel radial tyres. Staple holes allow moisture to penetrate into the tyre body. Confine any stapling to the tread area only.

5.6 Assorted Problems

a) Pin hole in bead area;

b) Low air pressure; and

c) Porous liner.

5.7 Acceptance Criteria of Casings

Passenger and light truck tyres casings showing any of the following weaknesses or injuries or damage shall not be accepted for retreading.

5.7.1 *External*

a) Exposed fabric or belt material in the tread area;

b) Ply separation;

c) Broken belts;

d) Excessive oxidation;

e) Surface cuts that penetrate the cord body and exceed the size of a repairable injury;

f) Broken or kinked beads;

g) Damaged beads exposing the ply cord area;

h) Radial cracking;

j) Circumferential cracking; and

k) Improper labelling.

5.7.2 *Internal*

a) Flex breaks, X-breaks, or impact breaks;

b) Porous or loose liners;

c) Defective inner liner splices beyond repair limits;

d) Evidence run flat or low;

e) Injury to the ply cord fabric in the bead area;

f) Temporary plugs in the sidewall area;

g) Casings with previous section repairs to damage outside specified injury limit; and

h) Nail holes larger than 6.4 mm.

5.7.3 Truck tyres accepted for retreading shall not contain any of the following weaknesses or injuries

a) Ply separation;

b) Broken, damaged, kinked, or exposed bead wires;

c) Injuries to the plies in the bead area;

d) Flex breaks;

e) Loose cords on the inside ply or evidence of having been under inflated or overloaded;

f) Tread separations;

g) Weather checking that extends to the body plies;

h) Non-repairable damage to the inner liner or bead sealing areas; and

j) Worn to the plies on more than 10 percent of worn tyre circumference except where breaks or belts are replaced or added.

5.7.4 In addition to above tyres showing any of the following damage shall not be accepted for retreading

a) Extensive cracking extending through to the carcass;

b) Carcass penetrations or damage to casings above "H" speed symbol except where these casings are to be down rated to a lower speed symbol;

c) Carcass break up;

d) Appreciable oil or chemical attack;

e) Multiple damage too close together;

f) Bead damage other than minor 'rubber only' damage;

g) Exposed cords due to tread wear or sidewall scuffing;

h) Non-repairable tread or sidewall material separation from the carcass;

j) Structural damage in the area of the sidewall; and

k) Corroded steel cord or bead wire.

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